REMARKS

The above Amendments and these Remarks are in reply to the Office Action mailed December 3, 2004.

Currently, claims 1-63 are pending. Applicants have amended claims 1-2, 11-12, 14-15, 17-20, 22-28, and 32, cancelled claims 29-31, 35-42, and 56-57, and withdrawn claims 43-53 and 58-63 from consideration. Applicants respectfully request reconsideration of claims 1-28, 32-34, and 54-55.

I. Information Disclosure Statement

Applicants' information disclosure statement filed on January 2, 2004 was rejected for failing to include copies of each foreign patent cited therein. It is respectfully submitted that copies of the foreign patents were included. Attached as Exhibit A is a copy of the postcard received from the USPTO with a stamp indicating receipt of copies of those patents. Also attached as Exhibit A is another copy of the form 1449 submitted with the statement as well as additional copies of the foreign patents. No fee is due as Applicants are merely resubmitting copies that were previously submitted.

II. Elections/Restrictions

Applicants hereby confirm election, without traverse, of Group II: Claims 1-42 and 54-57. Withdrawal of the claims in Group I from consideration has been confirmed in the above amendments.

III. Rejection of Claims 1-15, 17-19, 21-22, 24-33, 37, 39, 40, and 54-57

Claims 1-15, 17-19, 21-22, 24-33, 37, 39, 40, and 54-57 were rejected under 35 U.S.C. § 103(a) as being unpatentable over USPN 6,100,925 ("*Rosser*") in view of USPN 5,649,237 ("*Okazaki*"). Because *Rosser* and *Okazaki*, either alone or in combination, fail to teach or suggest each of the limitations of these claims pending after entry of the present amendments, and moreover, because *Okazaki* teaches away from the amended claims, Applicants respectfully submit that claims 1-15, 17-19, 21-22, 24-28, 32-33, and 54-55 are patentable over the cited art.

Figure 8 and the description on pages 19-20 describe relevant techniques for combining measurements from a gyro and an inclinometer to remove error components. As applicants describe:

> Figure 8 explains one method for combining a gyro with an inclinometer. The embodiment of Figure 8 assumes that the gyros are mounted on the tripod head interface

10 such that for each inclinometer there is a gyro mounted to measure data for the same axis. One gyro and one inclinometer are mounted on the pitch axis. Another gyro and inclinometer are mounted perpendicular to the pitch axis devices in order to measure the roll axis. Each gyro and inclinometer pair are independently used to measure pitch and roll. An additional gyro or gyro/inclinometer pair can also be used to measure yaw. The system of Figure 8 is used to measure pitch. An identical system is used to measure roll.

Gyro 610 is a fiber optic gyro which measures angular rate. It does not have any reference to absolute angle. It can accurately measure the relative angular change. The output of gyro 610 is integrated using a digital or analog integrator 614. The output of integrator 614 will represent an angle. The output of integrator 614 is scaled (block 624). We can describe the measured output of the integrated gyro signal as $A_G = A + e_G$ where A_G = integrated angle, A = actual angle gyro 610 was rotated and e_G = error induced by gyro 610. The error e_G is largely due to the offset drift of the gyro and only has low frequency components.

Inclinometer 604 can accurately measure the true pitch or roll of the camera mount but is subject to acceleration errors. Gravity and acceleration of a reference frame are indistinguishable, so it is difficult to tell the difference between gravity indicating which way is "down" and acceleration imposed on the sensor. Imagine that the camera mount is not disturbed and is on a very stable platform. The inclinometer will accurately read the angle of the camera mount because the only force acting on the inclinometer is gravity. If the camera mount is tilted, it will accurately measure the new pitch or roll. During the transient when rotating the camera mount, acceleration will be induced on the sensor unless the axis of rotation is precisely through the inclinometer sensor and the pan axis is nearly frictionless. The axis of rotation will typically not be through the inclinometer, so changes in pitch or roll will induce a transient error in the inclinometer reading. In addition to this error, the device being used has a slow response to transients. If the device is rotated rapidly about the axis so as not to induce acceleration errors, the response time is about one second. If we think about the inclinometer signal output errors in the frequency domain, we can say that the low frequency errors are very small because the average acceleration will be near zero as long as we are not translating the inclinometer to a new position. Most of the inclinometer errors will be high frequency due to transient accelerations. Let $A_I = A + e_I$ where A_I = measured angle from inclinometer, A = actual angle inclinometer 604 was rotated and e_I = the inclinometer measurement error due to acceleration and sensor response. The error e_I will have very little low frequency components.

Summer 616 will subtract A_G (output of scale block 624) from A_I (output of inclinometer 604) yielding e_I - e_G. This signal is passed through low pass filter (LPF) 618. The cutoff frequency of LPF 618 is chosen to pass the gyro error signal e_g but reject inclinometer error signal e_I. A typical cutoff frequency is 0.2Hz. The output of LPF 618 will be -e_G. Summer 620 will add signal A_G from scale block 624 to -e_G from LPF 618. The result is signal A, the desired actual angular rotation. *Specification*, pp. 19-20 (*emphasis added*).

Claims 1-15, 17-18, 25-27, and 54

Claim 1, as amended, captures select features as described above and now recites:

> a first sensor coupled to said camera assembly, said first sensor measures movement of said movable portion relative to said fixed portion; and
>
> a first inclinometer coupled to said camera assembly, said first inclinometer measures an angle of a first axis of said fixed portion of said camera assembly, said measured angle including an actual angle component attributable to a gravitational force on said first inclinometer and an error component attributable to an acceleration force on said first inclinometer;
>
> a first gyro coupled to said camera assembly, said first gyro measures a relative angular change of said first axis, said measured relative angular change including an actual relative angular change component substantially equal to said actual angle component of said angle measured by said first inclinometer and an error component attributable to at least one of offset and drift of said first gyro;
>
> circuitry adapted to receive said measured angle and said measured relative angular change, said circuitry combines said measured angle and said measured relative angular change to remove said error component of said measured angle and said error component of said measured relative angular change in order to determine a value of said actual relative angular change component.

Nothing within *Rosser* or *Okazaki*, or their combination, teaches or suggests such a combination of elements as recited. Specifically, neither reference teaches or suggest a "first inclinometer" <u>and</u> a "first gyro" that <u>both</u> measure an angle of a "<u>first axis,</u>" nor "circuitry" that "combines said measured angle and said measured relative angular change to remove said error component of said measured angle and said error component of said measured relative angular change in order to determine a value of said actual relative angular change component," as recited in claim 1 (*emphasis added*).

Rosser discloses "additional sensors 160 and 164" that are "accelerometers which measure acceleration in two orthogonal directions" and whose data "is integrated twice with respect to time to provide current displacement of the camera in the x and y directions." *Rosser, col. 20, ll. 35-43.* As the Examiner notes, *Rosser's* accelerometers are used to measure translational movement in the x and y directions. *Office action*, p. 4. *Rosser* does not teach or suggest that the accelerometers measure "an angle of a first axis of said fixed portion of said camera assembly" and that the "measured angle include[es] an actual angle component attributable to a gravitational force on said first inclinometer and

an error component attributable to an acceleration force on said first inclinometer," as recited in claim 1. Moreover, *Rosser* contains no disclosure of or anything to suggest sensors such as gyros in addition to the accelerometers that take measurements in the same directions as the accelerometers or with respect to a same "first axis," as recited in claim 1.

Okazaki on the other hand discloses "acceleration detectors" which are used to "calculate the displacements of the translational movements in the X- and Y-axis directions." *Okazaki, col. 5, ll. 33-35.* *Okazaki* also discloses "angular rate detectors 4, 5" and corresponding "integration" components which are asserted by the Examiner to be, in combination, inclinometers. *Id. at col. 4, ll. 25-29.* The outputs of the "angular rate detectors" are "integrated to calculate rotation angles around the X- and Y- axes." *Id. at col. 5, ll. 37-38.*

Okazaki, however, fails to disclose "a first inclinometer" <u>and</u> a "first gyro" that both measure angles of a single "first axis," as recited in claim 1. In *Okazaki*, one sensor measures angles while the other measures translational movements in the X- and Y-axis directions.

It is by substituting the combination of an "angular rate detector" and "integration" component in place of *Rosser's* accelerometers that the Examiner finds a teaching or suggestion of "a first inclinometer," as previously recited in claim 1. However, even if such a combination disclosed by *Okazaki* is substituted for the accelerometers of *Rosser* to disclose a "first inclinometer," nothing within the combination teaches or suggests a "first gyro" in addition to the "first inclinometer" that measures an angle of the same "first axis," as recited in claim 1. Moreover, even if the combination of an "angular rate detector" and "integration" component of *Okazaki* were <u>added</u> to the system of *Rosser* <u>in addition</u> to the accelerometers therein, there would not be two sensors that both measure an angle of a single "first axis." One sensor is disclosed to calculate displacement in the x or y directions while the other is disclosed to calculate a rotation angle. Accordingly, *Rosser* and *Okazaki,* either alone or in combination, fail to teach or suggest a "first inclinometer" that "measures <u>an angle of a first axis</u>" and a "first gyro" that "measures a <u>relative angular change of said first axis,</u>" as recited in claim 1 (*emphasis added*).

Furthermore, *Rosser* and *Okazaki*, either alone or in combination, fail to teach or suggest circuitry that "combines said measured angle and said measured relative angular change to remove said error component of said measured angle and said error component of said measured relative angular change in order to determine a value of said actual relative angular change component," as recited in claim 1. *Rosser* discloses accelerometers to measure x and y direction displacements but does not disclose other

sensors that measure movements in the same directions. Accordingly, *Rosser* does not teach or suggest "circuitry" that combines a "measured angle" and a "measure relative angular change" as recited in claim 1.

Okazaki discloses "acceleration detectors" and "angular rate detectors" but does not teach or suggest circuitry for combining the measurements of each to remove "said error component of said measured angle and said error component of said measured relative angular change to determine a value of said actual relative angular change component," as recited in claim 1. In fact, *Okazaki* teaches to <u>remove gravitational components</u> while claim 1 recites removing an "error component attributable to an acceleration force on said first inclinometer" and an "error component attributable to at least one of offset and drift of said first gyro." Claim 1 recites removing error components attributable to offset or drift of they gyro and acceleration of the inclinometer so that "a value of said actual relative angular change component" which is substantially equal to the "actual angle component <u>attributable to a gravitational force</u>" can be determined. *(Emphasis added)*. *Okazaki* does not teach or suggest circuitry to perform the combining and removal as recited in claim 1.

In addition to failing to teach or suggest each of the limitations of claim 1, Applicants respectfully submit that *Okazaki* teaches away from the invention recited in amended claim 1. By teaching to remove the gravitational components – the very type of component which is to be determined in claim 1 – *Okazaki* teaches away from the method of claim 1.

Okazaki includes a "gravitational acceleration component calculating means." *Okazaki, col. 5, ll. 23-25*. These means are used to calculate gravitational acceleration components so that "respective <u>gravitational acceleration components are removed</u> from the accelerations in the X- and Y-axis directions (i.e., from the output values of the acceleration detectors 1, 2)." *Id. at col. 5, ll. 30-33*. As recited in claim 1, however, the "first inclinometer" measures an angle that includes "an actual angle component attributable to a gravitational force on said first inclinometer and an error component attributable to an acceleration force on said first inclinometer." The "circuitry" is provided to remove "said error component attributable to an acceleration force" so that "a value of said actual relative angular change component" which is substantially equal to the "actual angle component <u>attributable to a gravitational force</u> on said first inclinometer" can be determined. Claim 1 does not recite removal of the gravitational component, but rather, determination of a value thereof. Thus, *Okazaki* teaches away from removing

error "attributable to an acceleration force on said first inclinometer" so that a value substantially equal to "an actual angle component attributable to a gravitational force" can be determined as recited in claim 1.

Because the combination of *Rosser* and *Okazaki* fails to teach or suggest each of the limitations of claim 1, and moreover, because *Okazaki* teaches away from the limitations of claim 1, Applicants respectfully submit that claim 1 is patentable over the cited art. Claims 2-15, 17-18, 25-27, and 54 each ultimately depend from claim 1 and should be patentable for at least the same reasons.

Claims 19, 21, 22, 24, 28, and 55

Claim 19 recites a method including steps performed by the elements of the system of claim 1. Accordingly, Applicants respectfully submit that claim 19 is patentable over the cited art for at least the same reasons as set forth above with respect to claim 1. Claims 21, 22, 24, 28, and 55 each ultimately depend from claim 19 and should be patentable for at least the same reasons.

Claims 32-33

Claim 32 recites a system including similar limitations to those of claim 1, in addition to other limitations. Accordingly, Applicants respectfully submit that claim 32 is patentable over the cited art for at least the same reasons as set forth above with respect to claim 1. Claim 33 depends from claim 32 and should be patentable for at least the same reasons.

IV. Rejection of Claim 20

Claim 20 was rejected under 35 U.S.C. § 103(a) as being unpatentable over *Rosser* in view of *Okazaki* in view of USPN 4,084,184 ("*Crain*").

Claim 20 depends from claim 19. As set forth above, the combination of *Rosser* and *Okazaki* fails to teach or suggest each of the limitations of claim 19 and *Okazaki* actually teaches away from claim 19. *Crain* was cited for the disclosure of transforming a three dimensional location using multivariable equations. However, *Crain* contains no disclosure offering a teaching or suggestion of the claim limitations of claim 19 that were described above. Accordingly, even if *Crain* is combined with *Rosser* and *Okazaki*, the resulting combination fails to teach or suggest each of the limitations of claim 19. Because claim 20 depends from claim 19, the combination of references fails to teach or suggest each of

the limitations of claim 20. Therefore, Applicants respectfully submit that claim 20 is patentable over the cited art.

V. <u>Rejection of Claims 16, 23, 34, and 41</u>

Claims 16, 23, 34, and 41 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Rosser* in view of *Okazaki* in view of USPN 5,462,275 ("*Lowe*").

Claim 41 has been cancelled. Claim 16 depends from claim 1, claim 23 depends from claim 19, and claim 34 depends from claim 32. As set forth above, the combination of *Rosser* and *Okazaki* fails to teach or suggest each of the limitations of claims 1, 19, and 32 and *Okazaki* actually teaches away from these claims. *Lowe* was cited for the disclosure of encoding camera motion data into an audio channel. However, *Lowe* contains no disclosure offering a teaching or suggestion of the claim limitations of claims 1, 19, and 32 that were described above. Accordingly, even if *Lowe* is combined with *Rosser* and *Okazaki*, the resulting combination fails to teach or suggest each of the limitations of claims 1, 19, and 32. Because claims 16, 23, and 34 each depend from one of claims 1, 19, and 32, the combination of references fails to teach or suggest each of the limitations of these claims. Therefore, Applicants respectfully submit that claims 16, 23, and 34 are patentable over the cited art.

VI. <u>Conclusion</u>

Based on the above amendments and these remarks, reconsideration of claims 1-28, 32-34, and 54-55 is respectfully requested.

The Examiner's prompt attention to this matter is greatly appreciated. Should further questions remain, the Examiner is invited to contact the undersigned attorney by telephone.

Enclosed is a PETITION FOR EXTENSION OF TIME UNDER 37 C.F.R. § 1.136 for extending the time to respond up to and including today, May 3, 2005.

The Commissioner is authorized to charge any underpayment or credit any overpayment to Deposit Account No. 501826 for any matter in connection with this response, including any fee for extension of time, which may be required.

Respectfully submitted,

Date: May 3, 2005

By: [signature]
David E. Cromer
Reg. No. 54,768

VIERRA MAGEN MARCUS HARMON & DENIRO LLP
685 Market Street, Suite 540
San Francisco, California 94105-4206
Telephone: (415) 369-9660
Facsimile: (415) 369-9665